

# **The Kentucky Minimum Specifications For School Buses 2010**



## **Diesel/Electric Hybrid Supplement**



**Office of District Support Services**

## **Forward**

The Kentucky Minimum Specifications for School Buses is the primary specification for all school buses in the Commonwealth pursuant to KRS 156.153. This document is supplemental to that specification and is applicable to Hybrid Diesel Electric buses only. All provisions of the primary specification shall be adhered to unless specifically mentioned in this supplement. This specification is for new hybrid school buses only and does not allow for the modification of any existing school bus.

## **Warranty**

All hybrid systems shall be warranted for three years, unlimited miles. In addition, all normal warranties listed in the Kentucky Minimum Specifications for School Buses shall not be compromised by the hybrid systems.

## **Training for Local School District Personnel**

The successful vendor shall provide training to local district personnel including Technicians and Driver Trainers. These classes shall be provided at multiple locations around the state in response to local demand. Class content, location and frequency shall be approved by the Kentucky Department of Education.

## **Compliance with FMVSS**

All Hybrid Systems shall be in full compliance with all applicable Federal Motor Vehicle Safety standards.

## **Hybrid Chassis Modification**

Charge sustaining hybrid electric drives may be installed on sixty-six (66) passenger type C school buses as a local district purchase option. These hybrid drives shall be designed to improve fuel economy while decreasing emissions.

All hybrid electric chassis shall be equipped with a master electrical disconnect as close to the batteries as possible and clearly marked in one inch block letters to enable first responders to readily identify the electrical hazard associated with the vehicle.

The hybrid called for in this specification shall be the charge sustaining type. All hybrid systems shall be factory installed by the Original Equipment Manufacture on new buses only.

The diesel electric Hybrid chassis shall comply with all specifications for a Type C school bus with the following exceptions and additions:

### **Batteries**

1. All system batteries shall be lithium ion technology. Any battery upgrade shall require the approval of the Department of Education.
2. Batteries shall be electronically monitored to ensure the charge is equally distributed for maximum battery life.
3. Batteries shall be air-cooled or water cooled. This cooling system shall include a fan to assist air movement.
4. Batteries shall be shrouded to guard against road debris and water.

### **Engine**

1. A Cummins ISB or MaxForce 7 engine shall be the standard engine for this application.
2. Minimum 200 horsepower, 520 ft/lbs torque.
3. All engines shall have a standard engine starting system in addition the hybrid drive.

### **Electric Motor/generator**

1. The electric motor shall assist launch by providing a minimum of 300Ft/lbs of torque. The generator shall produce regenerative braking of 300ft/lbs.
2. The electric drive shall have a manual disconnect that will allow the bus to operate as a conventional diesel if the electric drive is not functioning properly.
3. All hybrid systems shall be capable of engine only operation.

### **Hybrid Identification**

A hybrid electric vehicle emblem or label shall be affixed to the rear bumper. An emblem or label shall also be affixed to the right side of the bus rearward of the entrance door and to the left side of the bus aft of the driver's window.

**Inverter**

The power electronic modules and inverter shall have a cooling system separate from the engine cooling system.

**Transmission**

A hybrid electric drive systems shall use an Eaton Auto shift or an Allison 2500 PTS transmission.

**Warranty**

1. All systems shall be factory installed and backed by a two year unlimited mileage warranty.
2. The factory, through its dealer, shall be responsible for providing maintenance training to purchasing districts technicians.

**Wiring**

1. The hybrid drive system shall have a manual cut off switch.
2. High voltage wiring shall be color coded with orange sheathing.
3. High voltage decals shall be applied to the outside of the battery case and the power electronics carrier.